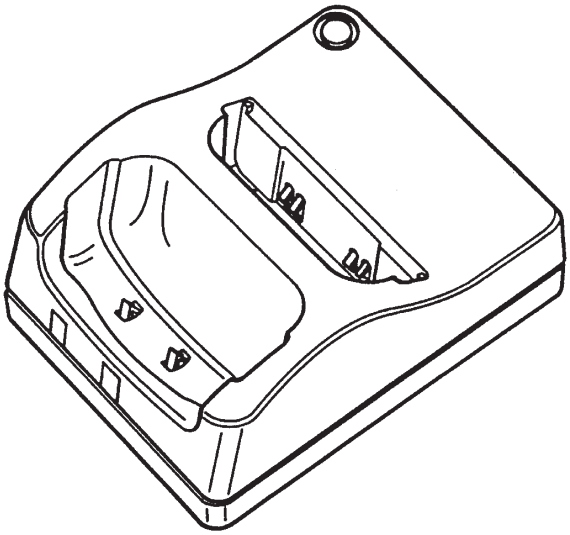
After Sales Technical Documentation

DESKTOP CHARGER
CHH–6



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DESKTOP CHARGER CHH–6

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Introduction

The CHH–6 Desktop Charger is designed to charge the phone and a spare battery; the battery can be any Ni–Cd or Ni–Mh type. In a standard configuration, rapid charging is possible by connecting the desktop charger to an ac power outlet via Rapid Charger, ACH–4. The rapid charger is connected to the phone via a dc connector located at the base of the phone.

Technical Summary

Operation

The desktop charger has a dc plug input connector for the rapid charger plus 2– and 4–pin output connectors for the phone and spare battery respectively. Charging takes place at battery temperatures of between +5 and +45 °C although when a spare battery is first fitted the temperature must be less than +40 °C to prevent overcharging an already hot battery. Control of the charging process for the phone is performed by the phone's internal microprocessor whilst control of charging the spare battery is done by the microprocessor located in the desktop charger. The phone is always charged first followed by the spare battery.

A battery provides a better capacity if it is occasionally discharged completely. The user can do this by using the 'deep discharge' feature. This feature is only provided for the spare battery slot and is activated by pressing the 'discharge' button. The spare battery will then automatically discharge and recharge to full capacity. If the 'discharge' button is pressed a second time the discharge function is cancelled.

Charging Indication

Charge status is indicated by dual–colour LEDs, one for the phone and one for the spare battery pack. The phone's liquid–crystal display also contains a three–bar battery display.

The LEDs remain extinguished when there is no phone or spare battery connected.

Right Desktop Charger LEDs (for Phone):

The **Red** LED indicates a fast charge mode.

The **Green** LED indicates a trickle (maintenance) charge mode. If the phone's LCD battery display is steady, the battery is fully charged, if the LED is green, but the phone's battery display is scrolling, charging is disabled due to battery temperature being out of the normal operating range.

Left Desktop Charger LED (for Spare Battery):

The **Red** LED indicates that the battery is not fully charged due to one of the following conditions: either the battery or the phone is being charged at the rapid rate or charging is disabled due to the battery temperature being out of the normal operating range.

The **Green** LED indicates that the battery is fully charged.

A **flashing RED** LED indicates that a discharge cycle has been activated.

List of Modules

Table 1. List of Modules

NAME OF MODULE	TYPE CODE	MATERIAL CODE	NOTES
Desktop Charger	CHH–6	0675041	Fully Assembled Charger
Charging Module	DC2H	0200296	Electronic Components
Assembly Parts	MCHH6	0260337	Mechanical Parts

Basic Specifications

Table 2. Basic Specifications

Battery Capacities:	380 mAh, 1100 mAh
Charge Time (spare battery only):	40mins max / 380 mAh: 80 % full 1h45 max / 1100 mAh: 80 % full
Charge Time (spare battery when phone in trickle charge):	1h max / 380 mAh : 80% full 2h30 max / 1100 mAh : 80% full
Discharge Time:	2h40 max / 380 mAh 7h20 max / 1100 mAh
Rapid Charge Temperature:	+5 to +45 °C (+40 °C when spare battery fitted)
Low Temperature Charge:	–20 to +5 °C (battery temperature)
Rapid Charge Cut–off:	temperature/–dV/peakV/timer
Trickle Charge Nominal:	C/20

Technical Specifications

Modes of Operation

Charge States and Charge Control

Charge current for the phone is supplied through a series switch transistor in the phone. When this transistor is on, the charger is supplying a constant current to the phone.

When the transistor is off, no current is supplied to the phone and the charger is in the constant voltage mode. In rapid charge mode, the phone turns the transistor on almost continuously.

Having been charged in the rapid charge mode, the battery is kept fully charged using pulsed charging, i.e. switching power alternately on and off at a variable low duty cycle and a frequency of a few hertz.

The Desktop Charger is also provided with control logic for spare battery charging, which is allowed when no phone is connected or when the phone is in the pulsed charge mode. When the phone is in pulsed charge mode, the spare battery is only charged with current pulses; this takes longer to charge than when no phone is present.

Charge Indication to User

The Desktop Charger has dual–colour LEDs to indicate the charge of the phone and the spare battery.

The liquid–crystal display of the phone also contains a three–bar battery charge display. ”Charging sequence active” (state A) is indicated by the bars lit sequentially, starting from the bottom bar (each bar is on for a period of 1 s).

”Battery full” (state B) is indicated by all three bars being continually lit.

Table 3. Phone Operating Status

PHONE OPERATING STATUS	LED	DISPLAY
Desktop charger connected to mains through ac adapter, phone disconnected	–	–
Phone connected to charger, charging disabled due to battery temperature	green	state B (All bars on) – flashes periodically
Rapid charge	red	state A (Bars lit sequantially)
Battery full – trickle charge	green	state B (All bars on)

Table 4. Spare Battery Operating Status

SPARE BATTERY OPERATING STATUS	LED
Desktop charger connected to mains through ac adapter, spare battery disconnected	–
Spare battery connected to charger, charging disabled either due to battery temperature, or due to rapid charge mode of the phone	red
Rapid charge of spare battery	red
Spare battery full – trickle charge	green
Discharge of spare battery	flashing red

DC Characteristics

Table 5. Supply Voltages and Power Consumption

PARAMETERS	TYPICAL / NOMINAL
Output voltage:	12.0 +/– 1 V at 0 to 800 mA output current
Output constant current:	750 +/– 70 mA within 5.0 to 10.0 V output voltage range
Discharge current:	135 mA ± 30 mA nominal at 5V
Discharge end voltage:	5 V (1 V / cell) ±4%
Operating input voltage:	12 Vdc ±1V
Max. input current:	800mA ±70mA

AC Characteristics

Table 6. Control Signals

PARAMETERS	MAXIMUM
Maximum radiated emissions:	–50 dBm max. at f > 1 GHz
	–57 dBm max. at f < = 1 GHz, except for
	–80 dBm max. at f 405...505 kHz,
	20... 30 MHz,
	70...110 MHz and
	145...200 MHz
Ripple & noise voltage output max:	30 mVrms below 200 MHz

Extreme Conditions

Short circuit at output: no–damage current 1 A max with Rapid Charger ACH–4.

External Signals and Connections

Table 7. List of Connectors

CONNECTOR NAME	CODE	NOTES	SPECIFICATIONS / RATINGS
Rapid charge ac adapter connector	X130		2–pole DC–jack
Phone charging connectors	X110, X111		
Spare battery connectors	X120 X121 X122 X123	the contact springs on the DC2H pcb module	

Table 8. Rapid Charger AC Adapter Connector X130

SIGNAL NAME	PIN / CONN.	NOTES
VDC	1	supply voltage input
GND	2	common ground

Table 9. Phone Charging Connectors X110, X111

SIGNAL NAME	PIN / CONN.	NOTES
VC	X110	charge voltage output
PDET/GND	X111	charge detect input / phone common ground

Table 10. Spare Battery Connector

SIGNAL NAME	CONTACT SPRING	NOTES
VBAT	X120	positive terminal of battery
BSI	X121	battery size identification input
BTEMP	X122	battery temperature sensing input
GND	X123	common ground

Mechanical Characteristics

UNIT	DIMENSIONS (mm) (W x H x D)	WEIGHT (g)	ENCLOSURE (MATERIAL etc.), COLOUR
CHH–6	71 x 37 x 99.5	65	Material: Cycoloy C1000HF 96127 Colour: Warm black
DC2H–module	91,5 x 56,5 x 17		
Dc jack X130 for rapid charger:	4.5 x 1.3, centre contact positive		

Environmental Conditions

Temperature Conditions

Table 11. Allowed Ambient Temperature (functional)

ENVIRONMENTAL PARAMETER	VALUE
Low air temperature	+ 5°C
High air temperature	+45°C

Table 12. Allowed Ambient Temperature (transportation and storage)

ENVIRONMENTAL PARAMETER	VALUE
Low air temperature	–40°C
High air temperature in unventilated enclosures 1)	+85°C
High air temperature in ventilated enclosures or outdoor air	+40°C

The high temperature also includes the effect of solar radiation through a window or other opening and heat radiation.

Warnings and Restrictions

Operation with the LCH–2 Cigarrette Lighter Charger is possible but not recommended because of confusing operation of the LCH–2 charge LED. It is not possible to use the Desktop Charger with the Travel Charger (ACH–3).

Functional Description

The Desktop Charger consists of microcomputer based control logic for spare battery charging and discharging.

Charging is controlled by processor D1. Processor D1 is a single–chip type controller incorporating RAM, ROM, A/D converter, and a multifunction timer/counter.

Table 13. Processor Input/Output Signals:

SIGNAL NAME	NOTES
PA0	Phone LED control, green: ”1”
PA1	Phone LED control, red: ”1”
PA2	Spare battery LED control, green: ”1”
PA3	Spare battery LED control, red: ”1”
PA4/DBIN	Discharge button input, ”0”: start discharge

Table 13. Processor Input/Output Signals: (continued)

SIGNAL NAME	NOTES
PA5/DISW	Discharge control output, ”1”: discharge enabled
PC6/BSW	Spare battery charge control ”0”: charge disabled ”1”: rapid charge PWM: pulsed mode
PC7	Watchdog reset output

Table 14. Outputs for Test Purposes Only

J14	J13	J12	J11	NOTES
0	0	0	1	Battery voltage hi limit reached
0	0	1	0	Max charge time
0	0	1	1	Voltage drop (delta V)
0	1	0	0	Battery temperature high
0	1	0	1	Constant voltage

Table 15. Processor A/D Inputs:

INPUT	NOTES
AN0/VBATL	Battery voltage range 0 to 11 V resolution 43 mV/bit
AN1/VBATH	High resolution battery voltage range 7.0 to 11 V resolution 16 mV/bit
AN2/PDET	Phone current detect PDET = ”1” for A/D value higher than 5 PDET = ”0” for A/D value 5 of or less
AN3/BTEMP	Battery temperature, 27 kohm pull–up resistor to +5 V reference supply
AN4/BSI	Battery size, 100 kohm pull–up resistor to +5 V reference supply
AN5/CHVOL	Charger voltage detection
AN7/LIREF	Lithium reference voltage input – DISABLED Range 0 to 5V Resolution 19.5 mV/bi

Circuit Description

Charging the Spare Battery

Charging current for the spare battery is fed via switching transistor V130 and Schottky diode V131. The transistor is controlled by the processor (BSW line). When the transistor is on, a constant current is supplied to the battery. This is the rapid charging mode. In the pulsed charging mode, charging current is adjusted by pulsing the rapid charge current.

Battery voltage is measured through resistor divider R143/R144 (100/121 kohm). The range measured is 0 to 11 V; a voltage variation of 43 mV can be detected. For improved resolution, i.e. rapid charge cut off, operational amplifier N140 is added. This amplifies the battery voltage by a factor of (1 + 100 kohm/56 kohm) and compares the result to a +5 V reference supply. The A/D converter receives a battery voltage range of 7.0 to 11 V; a better resolution of 16 mV results.

Battery size is determined by reading the BSI line state. This is pulled to +5 V reference voltage by R147 (100 kohm). In the battery pack a ”size” resistor is connected between BSI and GND.

Temperature is measured over the BTEMP line. This line is pulled to +5 V reference voltage by R145 (27 kohm). In the battery pack an NTC resistor is connected between BTEMP and GND.

Because the phone and the spare battery cannot be charged at the same time the charging current of the phone must be detected. This is done at the A/D input AN2 (PDET). The charging current for the phone is directed through series diode V114. If the voltage drop across the diode is higher than 100 mV (corresponding to an A/D value of 5), charging current is flowing to the phone.

The Desktop Charger has two dual–colour LEDs to indicate the charging states of the phone and the spare battery. See ”Charge Indication to User”.

Discharging the Spare Battery

The Desktop Charger is also provided with a discharge function. This is activated by pressing a discharge switch on top of the charger. The spare battery is then discharged before charging. Resistors R181–R188 determine the discharge current which is fed through switching transistor V134 which is controlled by the processor over the DISW line (pin 64). The battery is discharged to 5 V and thereafter charged normally. The state of the discharge switch is read via the DBIN line (pin 63).

Watchdog Circuit

The processor generates positive pulses to output PC7 (pin 18). These pulses are received by transistor V160 and discharging capacitor C161. The capacitor is charged through resistor R163. This voltage is fed to regulator N100 shutdown input (pin 3) through transistor V162. If the processor stops, the voltage across the capacitor increases and the regulator is switched off.

5V Internal Supply

An accurate 5V internal voltage supply is provided by N100 a precision regulator. The output of this may be switched off using the shutdown input (pin 3), which is controlled by the watchdog circuit. The input to the regulator is filtered by R107, R108 and C105, which removes noise due to the phone operation.

Flat Battery Operation

When a very flat battery is fitted (ie. voltage <4.3V) diode V129 is turned ON, charging the battery with a very low current: the current is limited by R109 and R110.

The charge transistor V130 must be turned off during this low voltage period, else the input to the voltage regulator, N100, is pulled low, causing the output voltage to drop.

The low charge current via diode V129 is sufficient to rapidly change the voltage of a flat battery, since the battery has a high input impedance in this low charge state.

Figure 1: Block Diagram

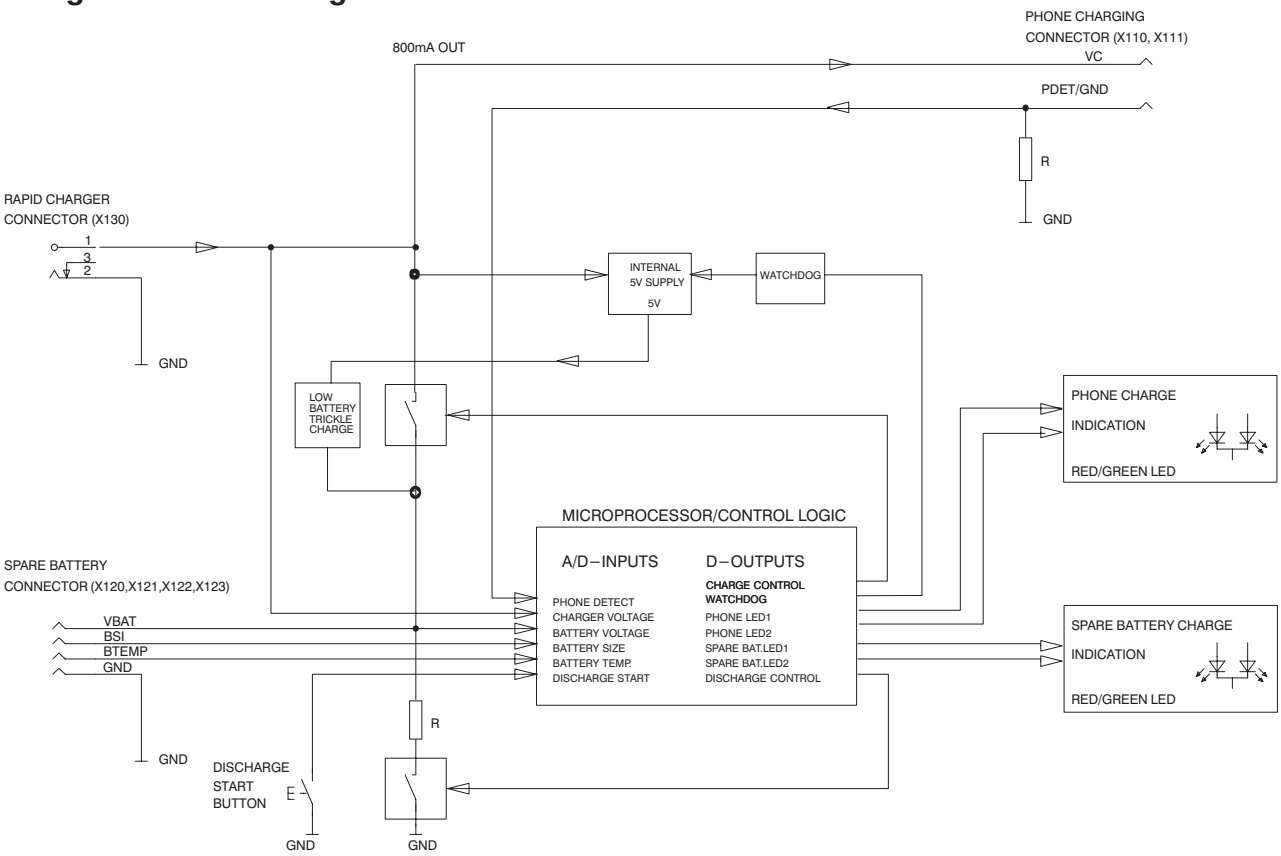
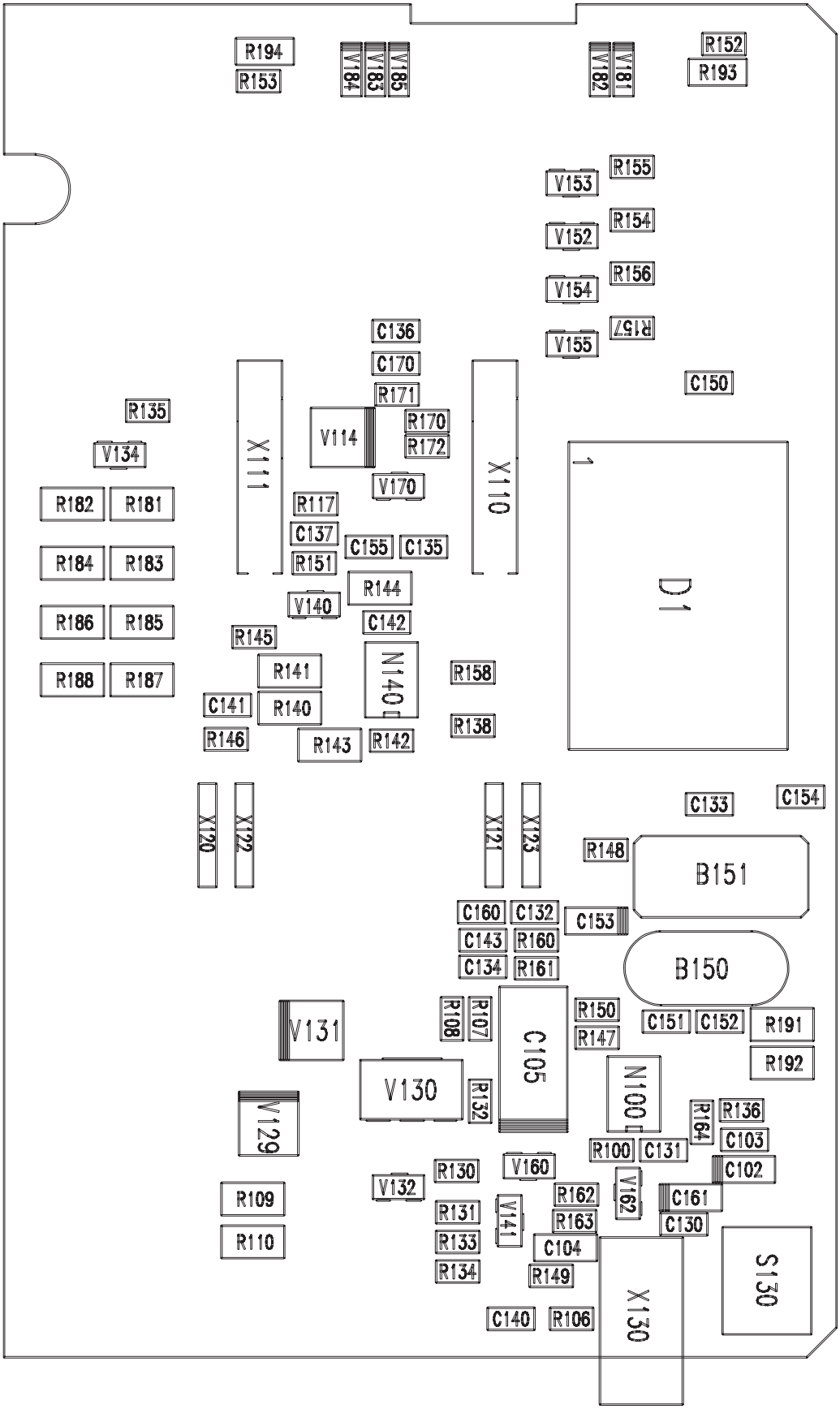
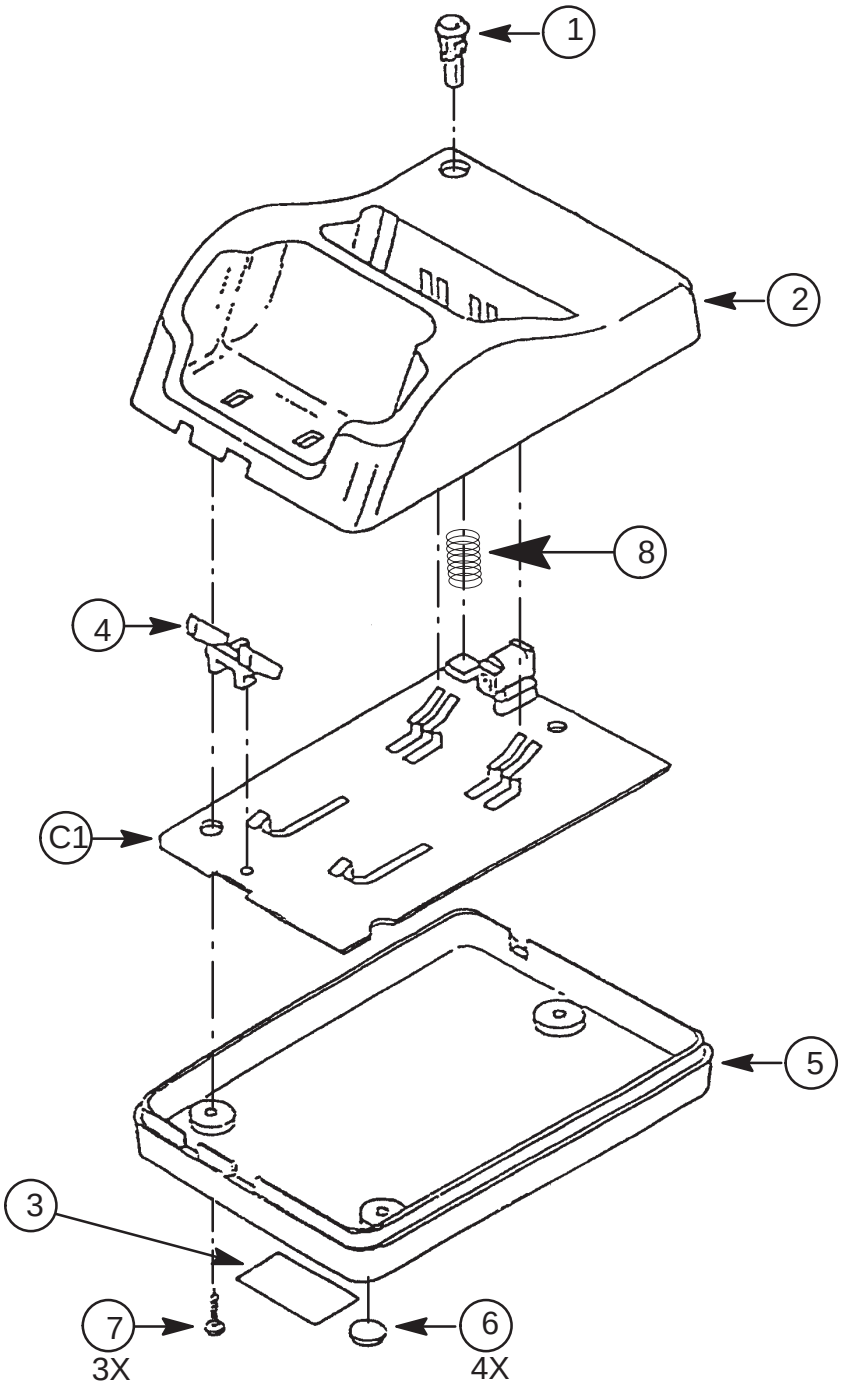


Figure 2: Component Location Diagram



Assembly

Figure 3: Exploded View



Assembly Parts

ITEM	QTY	CODE	DESCRIPTION	VALUE
1	1	9460089	Discharge Button	4D22992
2	1	9450325	Front Cover	D11317
3	1	9380488	Approval Label BABT	A12455
4	1	9460088	Light Guide	3D22993
5	1	9450323	Bottom Cover	D11318
6	1	6501067	Adhesive Foot	D8.0 H2.0 CLR
7	1	6293012	Pt–Screw KB22x8	WN1442
8	1	9560021	Spring	4D24398
C1	1	0200296	DC2H Module	

Parts List

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R100	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R106	1412286	Chip jumper		0805
R107	1411669	Chip resistor	22	5 % 0.063 W 0805
R108	1411669	Chip resistor	22	5 % 0.063 W 0805
R109	1415872	Melf resistor	120	1 % 0.2 W 0204
R110	1415872	Melf resistor	120	1 % 0.2 W 0204
R117	1413829	Chip resistor	10	5 % 0.063 W 0805
R130	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R131	1412310	Chip resistor	470	5 % 0.063 W 0805
R132	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R133	1412310	Chip resistor	470	5 % 0.063 W 0805
R134	1412310	Chip resistor	470	5 % 0.063 W 0805
R135	1412430	Chip resistor	10 k	5 % 0.063 W 0805
R136	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R138	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R140	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R141	1416040	Melf resistor	56.2 k	1 % 0.2 W 0204
R142	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R143	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R144	1416202	Melf resistor	121 k	1 % 0.2 W 0204
R145	1412609	Chip resistor	27 k	5 % 0.063 W 0805
R146	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R147	1413635	Chip resistor	100 k	5 % 0.063 W 0805

R148	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R149	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R150	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R151	1413635	Chip resistor	100 k	5 % 0.063 W 0805
R152	1413924	Chip resistor	220	5 % 0.063 W 0805
R153	1413924	Chip resistor	220	5 % 0.063 W 0805
R154	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R155	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R156	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R157	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R158	1412729	Chip resistor	33 k	5 % 0.063 W 0805
R160	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R161	1412430	Chip resistor	10 k	5 % 0.063 W 0805
R162	1413924	Chip resistor	220	5 % 0.063 W 0805
R163	1414244	Chip resistor	2.2 M	5 % 0.063 W 0805
R164	1414244	Chip resistor	2.2 M	5 % 0.063 W 0805
R170	1414533	Chip resistor	56 k	1 % 0.063 W 0805
R171	1414477	Chip resistor	12.0 k	1 % 0.063 W 0805
R172	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R181	1415576	Melf resistor	301	1 % 0.2 W 0204
R182	1415576	Melf resistor	301	1 % 0.2 W 0204
R183	1415576	Melf resistor	301	1 % 0.2 W 0204
R184	1415576	Melf resistor	301	1 % 0.2 W 0204
R185	1415576	Melf resistor	301	1 % 0.2 W 0204
R186	1415576	Melf resistor	301	1 % 0.2 W 0204
R187	1415576	Melf resistor	301	1 % 0.2 W 0204
R188	1415576	Melf resistor	301	1 % 0.2 W 0204
R192	1416040	Melf resistor	56.2 k	1 % 0.2 W 0204
R193	1411490	Chip resistor	100	5 % 0.12 W 1206
R194	1411490	Chip resistor	100	5 % 0.12 W 1206
C102	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.8
C103	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C104	2309475	Ceramic cap.	47 n	10 % 50 V 1206
C105	2604110	Tantalum cap.	10 u	20 % 25 V 7.3x4.4x2.8
C130	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C131	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C132	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C133	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C134	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C135	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C136	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C137	2310336	Ceramic cap.	18 p	5 % 50 V 0805

C140	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C141	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C142	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C143	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C150	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C151	2310343	Ceramic cap.	22 p	5 % 50 V 0805
C152	2310343	Ceramic cap.	22 p	5 % 50 V 0805
C153	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.8
C154	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C155	2310738	Ceramic cap.	4.7 n	20 % 50 V 0805
C160	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C161	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.8
C170	2307816	Ceramic cap.	47 n	20 % 25 V 0805
B150	4500822	Crystal	11.0592M	CL30PF H=3.6MM
V114	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V129	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V130	4210112	Transistor	SOT223	
V131	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V132	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V134	4200226	Darl. transistor	BCV27	npn 30 V 300 mA SOT23
V140	4100567	Sch. diode x 2	BAS70–04	70V15 mA SERSOT23
V141	4106992	Zener diode	BZX84	5 % 8.2 V 0.3 W SOT23
V152	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V153	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V154	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V155	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V160	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V162	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V170	4100567	Sch. diode x 2	BAS70–04	70V 15 mA SERSOT23
V181	4864378	LED	Green	2.2 V 0805
V182	4864380	LED	Red	0805
V183	4864378	LED	Green	2.2 V 0805
V184	4864380	LED	Red	0805
V185	4864380	LED	Red	0805
D001	4340034	MCU16/8 OTP16kx8	RAM256x8	QFP64
N100	4301062	IC, regulator	LP2951AC	SO8S
N140	4309576	IC, 2 x op.amp.	TLC27M2I	SO8S
S130	5200914	Push button switch	2–pole 6x7	SMD
X110	9560010	Conn.spring	4D22980	CHH–2/6
X111	9560010	Conn.spring	4D22980	CHH–2/6
X120	9510170	Batt.conn.spring	a11316	chh–6
X121	9510170	Batt.conn.spring	a11316	chh–6

X122	9510170	Batt.conn.spring a11316 chh–6
X123	9510170	Batt.conn.spring a11316 chh–6
X130	5407088	DC connector d4.5/3.8 h300